DRIVING MISS LAZY: AUTONOMOUS VEHICLES, INDUSTRY, AND THE LAW

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I. INTRODUCTION

While sixteen-year-olds of the future will have much less to celebrate, the disabled, elderly, and entertainment industry will soon rejoice at the advent of autonomous vehicles hitting the roadways. Although the arrival of autonomous vehicles into daily life is accelerating, "it will require a public-private partnership, and a community of legislatures and researchers and technology companies and automobile manufacturers."[1] In order to hold up its end of the public-private partnership, industry must adapt to reap the benefits and avoid challenges brought by autonomous vehicles.

These industrial adaptations are worth considering as changes in society are already underway to make room for driverless technology.[2] States including California, Florida, Michigan, and Nevada have already passed legislation that allow for the testing of autonomous vehicles on public roads, while additional states are contemplating similar legislation.[3] Although, to many, the notion of autonomous vehicles taking over roadways still feels more like the futuristic 1960's animated sitcom, The Jetsons, than reality. Nevertheless, the Center for Automotive Research prophesizes that the first commercially available, fully autonomous vehicle, could make an appearance in dealerships as early as 2019.[4]

This paper explores the growth of autonomous vehicles as well as the vehicles' potential and realized impacts on various industries such as the legal profession, the travel industry (specifically travel by trains and planes), the real estate industry, the trucking industry, and the entertainment industry. Before investigating potential effects on industry, this paper provides a brief

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[1] *A Brief History of Autonomous Vehicle Technology,* WIRED, https://www.wired.com/brandlab/2016/03/a-brief-history-of-autonomous-vehicle-technology/ (last visited Jan. 8, 2018).

[2] Jack Boeglin, *The Costs of Self-Driving Cars: Reconciling Freedom and Privacy with Tort Liability in Autonomous Vehicle Regulation*, 17 YALE J. L. & TECH. 171, 173 (2015).

[3] *Id.* at 172-173.

[4] *Id.* at 172.

history of autonomous vehicles that focuses on technological advancements and the rapid pace at which cars are becoming fully autonomous.

Central to the discussion of how autonomous vehicles will impact industry is how liability will be redistributed to compensate for the human driver that is no longer behind the wheel. Consequently, insurance companies must also respond to looming questions of liability that are yet to be answered. Who should be held at fault when a fully autonomous vehicle crashes and the accident was caused by a defective code in the software? Can the driver still be held liable? This paper further explores ways insurance companies and the judicial system may respond to these questions in order to welcome autonomous vehicles.

II. THE HISTORY OF AUTONOMOUS VEHICLES

Before autonomous vehicles can be regulated, it is essential that they be defined. The first glimpse at the concept of an autonomous vehicle occurred at the 1939 World Fair, where General Motors' Futurama exhibit envisioned "abundant sunshine, fresh air [and] fine green parkways upon which cars would drive themselves."[5] In the 1950's GM built upon their 1939 vision and teamed up with RCA to develop a "scale model automated highway system, which allowed them to begin experimenting with how electronics could be used to steer and maintain proper following distance."[6]

Still, vast development of fully autonomous vehicles did not begin until the twenty-first century.[7] Beginning in 2004, the military spearheaded a push for autonomous technologies.[8] The U.S. Department of Defense's research branch, the Defense Advanced Research Projects Agency ("DARPA"), held a competition that challenged vehicles to self-navigate across 150 miles of desert roadway.[9] Through DARPA's competitions, researchers at universities and corporations competed for a cash prize by creating vehicles able to perform advanced functions such as merging, parking, passing, and deciphering intersections with no human control or remote input.[10] Although no car finished the course in DARPA's 2004 competition, four cars completed the agency's 2007 competition, which simulated 60 miles of urban terrain.[11]

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[5] Tom Vanderbilt, *Autonomous Cars Through the Ages*, WIRED (Feb. 06, 2012, 6:30AM), https://www.wired.com/2012/02/autonomous-vehicle-history/.
[6] *Id.*
[7] Dylan LeValley, *Autonomous Vehicle Liability--Application of Common Carrier Liability*, 36 SEATTLE U.L. REV. 5, 6 (2013).
[8] *Id.* at 6-7.
[9] *A Brief History of Autonomous Vehicle Technology*, *supra* note 1.
[10] LeValley, *supra* note 7 at 7.
[11] *A Brief History of Autonomous Vehicle Technology*, *supra* note 1.

Though the vehicles competing in DARPA's competitions were designed largely by researchers in university labs, car manufactures and businesses alike took note and were inspired by the contests.[12] In fact, Google was so impressed by DARPA's contests that it recruited two winners to direct Google's own driverless navigation program.[13] By 2012, Google announced that their autonomous vehicles had completed more than 300,000 miles of testing without any accidents.[14] Google recognized that the DARPA course showed the vehicles were capable of autonomy, but the cars needed improved software to cope with the multitude of scenarios that occur in every day driving.[15] In 2014, Google's vehicles had logged 700,000 miles, and the company announced that they had revised their software to better handle city driving.[16] Accordingly, the new software could detect hundreds of diverse objects simultaneously, ranging from pedestrians to cyclists.[17]

In September 2017, the House of Representatives passed a bill that eventually would let car manufactures "each put [up to] 25,000 cars on the road even if some features don't meet current safety standards set by the National Highway Traffic Safety Administration."[18] The 25,000 cap would rise over a four-year period and ultimately allow each car manufacturer 275,000 autonomous vehicles by the end of the period.[19]

The recent bill passage sparks concern as there are still many kinks to work through as legislative and automotive progress continues to quicken.[20] In 2017, an experimental autonomous Jeep Grand Cherokee was observed to have mastered steady traffic, but struggled with unpredictable situations, much like Google's hypothesis.[21] When one of the Jeep's censors

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[12] Jeremy Levy, *No Need to Reinvent the Wheel: Why Existing Liability Law Does Not Need to Be Preemptively Altered to Cope with the Debut of the Driverless Car*, 9 J. BUS. ENTREPRENEURSHIP & L. 355, 362 (2016).
[13] *Id.*
[14] Chris Urmson, *The Self-Driving Car Logs More Miles on New Wheels*, GOOGLE BLOG (Aug. 7, 2012), https://googleblog.blogspot.com/2012/08/the-self-driving-car-logs-more-miles-on.html.
[15] *Id.*
[16] Chris Urmson, *The Latest Chapter for the Self-Driving Car: Mastering City Street Driving*, GOOGLE BLOG (Apr. 28, 2014), https://blog.google/topics/alphabet/the-latest-chapter-for-self-driving-car/.
[17] *Id.*
[18]Russ Mitchell, *Driverless Cars on Public Highways? Go for it, Trump Administration Says*, LOS ANGELES TIMES (Sept. 12, 2017), http://www.latimes.com/business/autos/la-fi-hy-driverless-regs-chao-20170912-story.html.
[19] *Id.*
[20] *See id.*
[21] Elizabeth Behrmann, *Robo-Car Brakes for Balloons as Real World Tests Driverless Hype*, BLOOMBERG (Aug. 31, 2017, 7:14 AM),

is triggered by grass or street litter, it "slams on its breaks every few hundred yards, like a nervous teenager with a learner's permit."[22] Furthermore, in 2016, a fatal accident involving a driver's overreliance on his Tesla's Autopilot system drew headlines.[23] This was "the first-known fatal accident involving semiautonomous driving technology."[24] The Tesla Model S's software "permitted [the driver's] disengagement from the driving task and let him use the Autopilot system on the wrong type of road."[25] One of the world's largest auto-components makers, Aurora, estimates that its revenues from autonomous vehicle sales will double to $1 billion by 2020, but Aurora's Chief Technology Officer admits that automated cars will operate in geo-constrained areas much sooner than in congested areas.[26]

III. AUTONOMOUS VEHICLES AND INDUSTRY

While the automobile manufacturers work out the remaining kinks, society and industry must anticipate the arrival of these futuristic vehicles. After all, the future of this new technology is worth some anticipation. "It's a [bright] future where vehicles will increasingly help drivers avoid crashes."[27] It's a future where time spent commuting will be made more productive, and where the elderly and people with disabilities are reintroduced to the freedom of easy roadway travel.[28] Perhaps most significantly, it is a future where fatalities and injuries resulting from driving are radically reduced.[29]

Since the establishment of the Department of Transportation in 1966, there have been more than 2.2 million motor-vehicle-related deaths in the United States.[30] "The major contributory factor in 94% of all fatal crashes is human error."[31] Autonomous vehicles carry the promise of delivering a safer travel environment.[32] From this safer travel environment, come a variety of

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https://www.bloomberg.com/news/articles/2017-08-31/robo-car-brakes-for-balloons-as-real-world-tests-driverless-hype.

[22] *Id.*

[23] Jim Puzzanghera, *Driver in Tesla Crash Relied Excessively on Autopilot, but Tesla Shares Some Blame, Federal Panel Finds*, LOS ANGELES TIMES (Sept. 12, 2017), http://www.latimes.com/business/la-fi-hy-tesla-autopilot-20170912-story.html.

[24] *Id.*

[25] *Id.*

[26] Behrmann, *supra* note 21.

[27] U.S. DEP'T OF TRANSPORTATION, AUTOMATED DRIVING SYSTEMS: A VISION FOR SAFETY (2017), https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/documents/13069a-ads2.0_090617_v9a_tag.pdf.

[28] *Id.*

[29] *Id.*

[30] *Id.*

[31] *Id.*

[32] U.S. DEP'T OF TRANSPORTATION, *supra* note 27.

industries that have the potential to flourish, as well as some industries that have the potential to decline.[33]

A. Legal Professionals

While there will be increased liability questions for some attorneys to solve, other attorneys such as personal injury lawyers may eventually feel a negative impact on business due to the increased safety that comes hand in hand with autonomous vehicles.[34] Personal injury law suits typically make up a vast proportion of civil litigation in the United States.[35] In fact, vehicle collisions accounted for 35% of all civil trials in 2005.[36] Once autonomous vehicles are populous and efficient, these vehicle collision suits may all but be eliminated leaving personal injury attorneys to make their way into another area of law, or otherwise leave the legal profession.[37]

However, even if autonomous vehicles do as they promise and reduce the frequency and severity of accidents, liability will still be an issue for manufacturers and legislatures to consider.[38] The consideration of liability will revolve around three factors: who will be liable, what weight the court will give to the overall safety of autonomous vehicles relative to passenger driven vehicles in making the determination of who to hold liable, and finally, whether or not a vehicle "defect" that creates possible manufacturer liability will be found in a larger percentage of accidents than with conventional accidents where driver error is usually the cause.[39] Depending on how these factors are determined, liability questions may be a deterrent to manufacturers of autonomous vehicles, and personal injury

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[33] *Id.*
[34] Chunka Mui, *Driverless Car Ripple Effects -- As Far As The Eye Can See (Part 2)*, FORBES (Jan. 24, 2013, 9:36 AM), https://www.forbes.com/sites/chunkamui/2013/01/24/googles-trillion-dollar-driverless-car-part-2-the-ripple-effects/#5f829d9e3056.
[35] Melinda Helbock, *Statistics of Personal Injury Cases Nationwide*, The Law Office of Melinda J. Helbock A.P.C., https://www.personalinjurysandiego.org/personal-injury/statistics-of-personal-injury-cases-nationwide/ (last visited Apr. 21, 2018).
[36] U.S. DEP'T OF JUSTICE, BUREAU OF JUSTICE STATISTICS SPECIAL REPORT: CIVIL BENCH AND JURY TRIALS IN STATE COURTS (2005) (report by Lynn Langton & Thomas H. Cohen), https://www.bjs.gov/content/pub/pdf/cbjtsc05.pdf.
[37] Damon Lavrinic, *Personal Injury Lawyer Says Self-Driving Cars Will End His Business*, JALOPNIK (Dec. 31, 2014, 3:00 PM), https://jalopnik.com/personal-injury-lawyer-says-self-driving-cars-will-end-1676858818.
[38] Gary E. Marchant & Rachel A. Lindor, *The Coming Collision Between Autonomous Vehicles and the Liability System*, 52 SANTA CLARA L. REV. 1321, 1322 (2012).
[39] *Id.*

attorneys, as well as other professionals expected to be impacted, may remain out of the woods longer into the future.[40]

DUI attorneys and legislatures additionally have many questions to consider when it comes to autonomous vehicle liability for occupants that are under the influence of alcohol. Imagine the following scenario: It is the year 2030 and your life as a young adult cannot be beat as you have just purchased your first self-driving car. Naturally, you celebrate the end of your relationship with Uber by hopping in your new chauffeur/vehicle and heading out for several drinks. At the end of a long night, you are in the car autonomously driving home when your car strikes another vehicle. The officer arrives at the scene and you are obviously intoxicated. Historically, this situation would be panic inducing for a variety of reasons. In reality, in 2030 the situation will most likely still be panic inducing, but perhaps there will be less of a threat of DUI liability.

Currently, under the above scenario the human driver would still be liable since DUI laws have not been altered in any way to compensate for a self-driving vehicle that is not directly controlled by the driver.[41] Another reason for the current driver liability outcome and lack of change in DUI law is the fact that the cars presently on the market still require too much interaction with occupants.[42] However, once these autonomous vehicles become a way of life, legislatures likely will be forced to respond to a question that asks whether the "driver" should still be held accountable although not technically "driving" in the manner traditionally associated with the word.

How should legislatures respond to prepare for vehicles that are soon to double as designated drivers? It is pertinent to consider the way the law is currently designed. Most states' DUI laws utilize the word "driving" or "operate."[43] There is a general consensus on how "driving" is defined. "If the vehicle is in motion and an occupant is doing anything to steer, navigate, accelerate, decelerate, or brake the vehicle, they are considered to be driving it."[44] In the context of an autonomous vehicle, this would not present much of an obstacle, as there would be no human driving. The more difficult analysis presents itself in relation to the definition of the word "operate."[45] Since one could technically very minimally "operate" a vehicle without "driving," the definition of "operate" has potential to present a larger

[40] *Id.*
[41] Michael Romano, *Can You Get a DUI in a Self-Driving Driverless Car?*, Romano Law PC, https://romanolawpc.com/dui-self-driving-driverless-car/ (last visited Jan. 8 2018).
[42] *Id.*
[43] *Id.*
[44] *Id.*
[45] *Id.*

deterrent to passengers using their autonomous vehicles as designated drivers.[46]

There is less consensus among states in defining what constitutes operation of a vehicle.[47] In Ohio, for example, operation is framed as "actual physical control" and has been defined to require that "a person be in the driver's seat of a vehicle, behind the steering wheel, in possession of the ignition key, and in such condition that he is physically capable of starting the engine and causing the vehicle to move."[48] Ohio's narrower definition of operation still presents a problem since the owner of the vehicle is likely to always be in possession of the ignition key. A possible way to avoid liability in Ohio would be to make sure that as an occupant you are never in the driver's seat of a vehicle and behind the steering wheel. However, because there is no precedent on the issue of fully autonomous designated driving, there is still significant risk of a DUI conviction involved.

As for comparison to Ohio DUI law, Alabama defines "actual physical control" as "exclusive physical power, and present ability, to operate, move, park, or direct whatever use or non-use is to be made of the motor vehicle at the moment."[49] In the context of fully autonomous vehicles, Alabama's definition presents a large complication because the occupant will likely always have the present ability to "direct" the vehicle. After all, there must still be some communication between the autonomous driver and the passenger in the future. There must be some interaction that indicates where the occupant wishes to go and where it would like to be picked up. Alabama's law is a great example of the issues legislatures must work through to find an equitable outcome. In theory, the only way presently to avoid liability in an autonomous vehicle would be to program all route and navigation information while entirely sober, or have someone else who is sober do the programming. One must also be sentenced to the backseat after becoming impaired, or risk being "in control" of the car.[50] Finally, the autonomous car would have to be designed to sense entry of the occupants and control the ride without the slightest input from the occupant.[51]

Because these options are rather impractical, legislative change will be unavoidable. Of course, the ultimate outcome of occupant liability begs the additional question: who does bear the liability if occupants do not? Legislatures' resolutions on how to disperse liability between manufacturers

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[46] Romano, *supra* note 41.
[47] *Id.*
[48] *Id.* (citing City of Cincinnati v. Kelley, 351 N.E.2d 85, 87-88 (1976) (footnote omitted), *cert. denied*, 429 U.S. 1104, 97 (1977).
[49] *Id.* (citing Key v. Town of Kinsey, 424 So.2d 701, 703 (Ala. Crim. App. 1982) (citing State v. Purcell, 336 A.2d 223 (Del. Super. Ct. 1975)).
[50] *Id.*
[51] Romano, *supra* note 41.

and occupants will not be easy and the legislatures' decisions must carefully consider public policy.

B. Planes, Trains, and Autonomous Automobiles

Next, consider air travel, which has gotten quite the negative reputation recently between passengers getting dragged from their seats on flights[52] and increased fees for checking luggage.[53] Envision the increased comfort and convenience when travelling domestically that autonomous vehicles will bring.

> Your car wakes you up at four o'clock in the morning, picks you up and drives you autonomously the entire way from Munich to Berlin. You can sleep, you can prepare for your meeting, you can call your friends and family, do whatever you want and enter Berlin in a very relaxed mood,

Audi's Vice President, Sven Schuwirth, remarked.[54] Travel by land comes with the instant advantage over air travel with easy access to Wi-Fi, which frees passengers from the expense and uncertainty of a bad connection while in the air.[55] As a result, in a driverless car, more meetings can be conducted and more emails can be responded to with the effect of overall business productivity skyrocketing (or should I say, "groundrocketing?") while en route.[56] In fact, the Boston Consulting Group (BCG) conducted a consumer survey that revealed that "increased productivity is the reason many drivers cite when they say they would consider buying or using an" autonomous vehicle.[57]

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[52] Darran Simon, *Officers Fired Over Removal of United Passenger*, CNN (Oct. 17, 2017, 10:49 PM), http://www.cnn.com/2017/10/17/us/united-airlines-flight-officers-disciplined/index.html.

[53] Brad Tuttle, *More Travelers Are Fighting Back to Avoid Airline Baggage Fees*, TIME (May 6, 2014), http://time.com/89509/more-travelers-are-fighting-back-to-avoid-airline-baggage-fees/.

[54] Marcus Fairs, *Driverless Cars Could Spell the End for Domestic Flights, Says Audi Strategist*, DEZEEN (Nov. 25, 2015), https://www.dezeen.com/2015/11/25/self-driving-driverless-cars-disrupt-airline-hotel-industries-sleeping-interview-audi-senior-strategist-sven-schuwirth/.

[55] Cyrus Radfar, *Dear United: Autonomous Cars Will Pull You Out of Your Seat*, TECH CRUNCH (Jul. 16, 2017), https://techcrunch.com/2017/07/16/dear-united-autonomous-cars-will-pull-you-out-of-your-seat/.

[56] *Id.*

[57] Joel Hazan, Nikolaus Lang, Peter Ulrich, Jeffrey Chua, Xanthi Doubara & Thomas Steffens, *Will Autonomous Vehicles Derail Trains?*, BCG (Sept. 30, 2016), https://www.bcg.com/publications/2016/transportation-travel-tourism-automotive-will-autonomous-vehicles-derail-trains.aspx.

Air travel is not the lone transportation industry expected to be threatened by autonomous vehicles.[58] Train travel has been derailed by automobiles in the past and the introduction of autonomous vehicles will likely further the damage.[59] Over a century ago, train travel dominated the long-distance transportation market.[60] Unsurprisingly, once the automobile was introduced, passengers increasingly chose their cars over trains and car travel dominated the long-distance travel market.[61] Presently, in Western countries, train travel claims merely a 10% to 20% share (at most) of the passenger transportation market.[62]

While these percentages seem small, many Americans rely on train travel for their daily commutes to work.[63] If you have ever lived in a metropolitan area with a metro or subway system, such as D.C. or New York, chances are you fully understand the allure of beginning your mornings quietly sipping coffee in the comfort of your own vehicle as opposed to getting shoved by smelly strangers in a cramped train car.

It is inherently difficult to speculate on how fully autonomous vehicles, a complex technology not currently on the market, will cause an impact on train commuting, but we can look to other inventions that have eased the plight of commuters. For instance, the concepts of ride sharing and car sharing have recently attempted to make commuting by car less costly and more efficient. "Car sharing" is a model of car rental where people rent cars for short periods of time, usually hourly.[64] Whereas, "ride sharing" refers to multiple passengers sharing the same third-party car simultaneously (think, UberPool).[65] More than 86,000 car-sharing vehicles were in operation in 2015, with around 5.8 million users.[66] While car sharing and ride sharing quickly gained and are continuing to gain popularity, the services represent a small fraction of cars on the roads.[67] Once fully autonomous vehicles are introduced, these services could become even more lucrative as sharing an autonomous vehicle will significantly cut the costs and hassle of owning an autonomous vehicle.[68]

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[58] *Id.*
[59] *Id.*
[60] *Id.*
[61] *Id.*
[62] Hazan, *supra* note 57.
[63] Jareen Imam, *The Surprising Comeback of Train Travel*, CNN (Oct. 18, 2014), https://www.cnn.com/travel/article/irpt-train-comeback/index.html.
[64] Hazan, *supra* note 57.
[65] *Id.*
[66] *Id.*
[67] *Id.*
[68] *Id.*

But just how much cheaper will car sharing and ride services be than train travel? Many variables come into play when determining cost projections. Some of the variables to consider include vehicle age, number of kilometers driven per year, and parking costs.[69] The Boston Consulting Group compared the costs of commuting by train, by traditional car, and by autonomous vehicle.[70] The study found that presently, the cost of taking the train is much cheaper than traveling as a single passenger in one's own traditional car.[71] Additionally, if the car was a personally owned autonomous vehicle, the difference in cost would be even greater because fully autonomous technology will add roughly $3,000 to the purchase price of autonomous vehicles.[72] Finally, autonomous vehicle ride sharing and car sharing has the potential to reduce the costs of commuting 25% per kilometer, but will still be pricier than train travel for an individual passenger.[73] However, commuting by car becomes cheaper than commuting by train if three or more passengers opt-in to ride sharing and fill an autonomous vehicle.[74]

As a result, the ultimate factor determining whether commuters stray from train travel comes down to what each individual values. If it is truly not burdensome to the individual to travel by train, it might be easier for that individual to continue their train commuting routine. But if the individual views commuting by train as a dreadful experience, there is a great incentive to forgo the train since ride sharing is an efficient and cheaper alternative so long as there are three or more passengers in a car. Personally, I predict most will choose to avoid the annoyance of commuting by train and quickly learn to love the convenience of ride sharing and car sharing.

C. The Trucking Industry

If the bulk of your job requires you to spend time behind the wheel, now is probably a good time to start considering a career change. One of the most prominent professions likely to feel a substantial impact by the advent of autonomous vehicles is the trucking industry. "When autonomous vehicle saturation peaks, U.S. truck drivers could see job losses of 25,000 a month, or 300,000 a year, according to a report from Goldman Sachs Economics Research."[75] The report indicates that truck drivers will see the bulk of job

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[69] Hazan, *supra* note 57.
[70] *Id.*
[71] *Id.*
[72] *Id.*
[73] *Id.*
[74] Hazan, *supra* note 57.
[75] Anita Balakrishnan, *Self-Driving Cars Could Cost America's Professional Drivers Up to 25,000 Jobs a Month, Goldman Sachs Says*, CNBC (May 22, 2017, 2:45 PM), https://www.cnbc.com/2017/05/22/goldman-sachs-analysis-of-autonomous-vehicle-job-loss.html.

loss when compared to other driving-centric professions, such as bus or taxi drivers.[76]

This anticipated job loss for truckers makes logical sense considering employment statistics. In 2014, there were a total of 4 million driver jobs in America, of which 3.1 million were truck drivers, representing 2 percent of total employment.[77] In fact, "truck driving is the most popular occupation in 29 of the 50 states."[78] "This means that in most of the country, one has a greater chance of meeting a truck driver than a member of any other occupation."[79]

For as much concern as there is over the death of the trucking industry, the non-driving components of a truck driver's job might just be the trucking profession's saving grace. Truck drivers do a lot more than simply drive the truck. They take inventory, inspect loads, manipulate loading docks, and place orders.[80] After a more careful consideration as to the role truck drivers play in delivery, many of their daily functions are much more complex than just driving a truck on the interstate.[81]

Because it will be difficult for autonomous vehicle technology alone to replace all essential functions of truck drivers, it is likely that instead of complete job loss the trucking profession will just evolve, at least initially.[82] Ideally, truck drivers would still be employed, yet employed in a much less stressful job. Truck drivers are currently faced with challenging, and sometimes life-threatening decisions as part of their daily driving. Truck drivers are trained how to crash, and the results of those snap decisions can cause roadway casualties.[83] There will always be snap decisions to make on the road, such as the choice to avoid colliding with another vehicle on the road or hitting the pedestrian that darted out in front of you. Hopefully, since autonomous vehicles should eventually be equipped to handle such choices in a way that causes no injury at all, this decision will no longer be one for truck drivers.

However, delegating the decision between life-and-death to programmers raises different questions. When faced with decisions of the "best" way to crash, autonomous vehicles will essentially be programed

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[76] *Id.*
[77] *Id.*
[78] Jacob Rossman, *The Impact of Autonomous Vehicles on the Trucking Industry*, FRONETICS (May 15, 2017) https://www.fronetics.com/impact-autonomous-vehicles-trucking-industry/.
[79] *Id.*
[80] *Id.*
[81] *Id.*
[82] *See id.*
[83] Rossman, *supra* note 78.

"morally."[84] Will society be comfortable entrusting programmers with these decisions? What if the moral decision was instead allotted to consumers, fundamentally giving passengers the choice of how much to protect themselves as opposed to other cars and pedestrians? Researchers at MIT have added to the discussion of morality with the creation of the Moral Machine. The Moral Machine serves as "a platform for gathering a human perspective on moral decisions made by machine intelligence, such as self-driving cars."[85] While taking the MIT "game," participants are faced with moral dilemmas, where an autonomous vehicle must choose the lesser of two evils, such as killing two passengers or five pedestrians.[86] The participants are then asked to judge which outcome is preferable.[87]

Of course, these moral dilemmas are not just relevant to truck drivers. Autonomous vehicles truly will present a social dilemma. This social dilemma is one being taken seriously by policymakers in Washington. Members of Congress are considering legislation that allows the broader adoption of autonomous vehicle technology without compromising safety.[88] While it is true that self-driving technology will likely diminish roadway deaths, the vehicle technology will also be unavoidably imperfect. Furthermore, human beings are more inclined to forgive mistakes made by humans than machines.[89] Accordingly, some hypothesize society may be slower to consume autonomous vehicles than expected.[90]

People are also notoriously irrational when it comes to fear-based decision-making and perhaps this will influence the response to autonomous vehicles.[91] For example, many people avoid flying because they are afraid of plane crashes.[92] Many people avoid the ocean because they are afraid of shark attacks.[93] Conversely, the odds of each of these events are extremely low.[94]

Moreover, humans are historically proven to be slow to respond to new technologies. Harvard University professor, Calestous Juma, has studied this phenomenon and notes a similarity between autonomous vehicles and,

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[84] *Id.*
[85] *Moral Machine—Human Perspectives on Machine Ethics*, MIT, http://moralmachine.mit.edu (last visited Jan. 8, 2018).
[86] *Id.*
[87] *Id.*
[88] Steven Overly, *The Big Moral Dilemma Facing Self-Driving Cars*, WASHINGTON POST (Feb. 20, 2017), https://www.washingtonpost.com/news/innovations/wp/2017/02/20/the-big-moral-dilemma-facing-self-driving-cars/?utm_term=.b3420db7721c.
[89] *Id.*
[90] *Id.*
[91] *Id.*
[92] *Id.*
[93] Overly, *supra* note 88.
[94] *Id.*

oddly enough, refrigerators.[95] While scientists understood that cold storage was excellent for cutting down on food-borne illnesses, reports of refrigeration equipment catching on fire or exposing toxic gas made the public hesitant to respond.[96] From this noted contradiction associated with refrigerators, Professor Juma concluded that "there are moments when new technologies that could be beneficial for humanity [. . .] very often end up being opposed by the same groups that might benefit from those technologies."[97] It will be quite interesting, to say the least, to observe how the public will respond and consume autonomous vehicles when actually presented with the option to do so, imperfect technology included.

D. Commercial Real Estate

It is now well established that modes of travel and the travel industry at large will change; because of this travel change, it naturally follows that the commercial real estate industry will feel the effects of autonomous vehicles in terms of sprawl. City planners already feel concern over autonomous vehicles' potential to reshape development patterns and the urban landscape.[98] The concern among real estate developers is that once autonomous vehicles hit the market, the "convergence of three new technologies—automation, electrification, and shared mobility—has the potential to create a whole new wave of automation-induced sprawl" that will lack proper planning and regulation.[99]

However, a recent policy brief from the Institute of Transportation Studies at the University of California, Davis, suggests a solution to developers' fear of increased urban sprawl.[100] The brief recommends a "sustainable planning approach that supports both higher density development and lower single-occupant driving can put people first rather

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[95] Steven Overly, *Humans Once Opposed Coffee and Refrigeration. Here's Why We Often Hate New Stuff*, WASHINGTON POST (Jul. 21, 2016), https://www.washingtonpost.com/news/innovations/wp/2016/07/21/humans-once-opposed-coffee-and-refrigeration-heres-why-we-often-hate-new-stuff/?utm_term=.686a5dd6647e.

[96] Steven Overly, *The Big Moral Dilemma Facing Self-Driving Cars*, WASHINGTON POST (Feb. 20, 2017), https://www.washingtonpost.com/news/innovations/wp/2017/02/20/the-big-moral-dilemma-facing-self-driving-cars/?utm_term=.27865d564c65.

[97] *Id.*

[98] Patrick Sisson, *As Self-Driving Cars Hit the Road, Real Estate Development May Take New Direction*, CURBED (May 16, 2017), https://www.curbed.com/2017/5/16/15644358/parking-real-estate-driverless-cars-urban-planning-development.

[99] *Id.*

[100] Marco Anderson & Nico Larco, *Land Use and Transportation Policies*, UC DAVIS (April 2017), https://3rev.ucdavis.edu/wp-content/uploads/2017/04/3R.LandUse.Final_.pdf.

than their cars."[101] So, how might this be achieved? Largely by application of the same policies currently being implemented to mitigate traditional urban sprawl.[102] Some of these strategies include approaches motivated by the concepts of smart growth, sustainable communities planning, and new urbanism.[103]

Pricing will also play an important role in preventing increased sprawl and environmental damage.[104] For example, making travel less expensive with each additional passenger in the car and additionally by pricing according to vehicle size will discourage single occupancy trips, and thus will discourage the remote relocation of consumers.[105] Furthermore, the price of parking should be reformed.[106] As many of us have experienced, the price of parking is quick to effect a behavioral change in consumers.[107] If excessively priced "on-site or adjacent parking continues to be the norm, then we can expect a proliferation of individually owned self-driving cars that drop off passengers."[108] It follows that it is in the best interest of those looking to prevent sprawl to immediately dramatically reduce parking costs. However, as society evolves, it is likely commercial underground parking garages will disappear altogether.[109] In 2016, in the Washington D.C. metro area, commercial parking garages were estimated to add 10-12% to the total cost of office construction.[110]

The world of real estate will change in more ways than just increased sprawl. For instance, approximately 15-20% of space in the average home is dedicated to the garage.[111] Once autonomous vehicles are predominant, perhaps there will be zoning changes made to keep pace.[112] Finally, assuming autonomous vehicles take the form of ride share industry's "pay-per-mile" rather than full car ownership, there will no longer be a need for gas stations and we will be left with 125,000 vacant stations.[113]

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[101] *Id.*
[102] *Id.*
[103] *Id.*
[104] *Id.*
[105] Anderson & Larco, *supra* note 100.
[106] *Id.*
[107] *Id.*
[108] *Id.*
[109] Deborah Findling, *How Self-Driving Cars Will Profoundly Change Real Estate*, CNBC (May 2, 2017, 11:35 AM), https://www.cnbc.com/2017/05/02/how-self-driving-cars-will-change-real-estate.html.
[110] *Id.*
[111] *Id.*
[112] *Id.*
[113] *Id.*

E. The Insurance Industry

The question of morality will be just one more question for insurance providers and judges to consider. Could a plaintiff bring a cause of action because a driver programmed their car to be self-protecting at the expense of pedestrians? Would insurance policies cover the consumer's moral choices? Before more complex questions like these are addressed, however, insurance companies will have broader questions to work through.

The natural response of the insurance industry may be panic since it is logical to conclude that there will be less demand for insurance policies as less consumers are physically behind the wheel. "Billionaire investor Warren Buffet, whose company, Berkshire Hathaway, owns" one of the top insurance providers Geico, seems to validate this logical conclusion.[114] "If the day comes when a significant portion of the cars on the road are autonomous, it will hurt Geico's business very significantly," Buffet told CNBC in February 2017.[115]

A report produced by KPMG supports Buffet's assertion and further provides that "a continual decline in the frequency of accidents" should decrease industry costs, with the fall starting approximately in a decade "as the vehicle stock converts."[116] The report predicts that insurance also must alter "as commercial and products liability lines expand."[117] KMPG's report predicts a scenario within twenty-five years where the personal auto insurer sector could shrink to 40% of present size, bringing serious market issues, with evolving business models and new competition only increasing the intensity of the rapid change.[118]

Assuming autonomous vehicle owners still make the choice to keep an insurance policy on some level, the question will shift to how insurance rates should be calculated. Presently, insurance rates are calculated largely on how much of a risk the driver is.[119] Insurance companies base rates on some combination of drivers' claim histories and their driving records.[120] Some insurance companies even use tracking devices and apps that allow

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[114] Yuki Noguchi, *Self-Driving Cars Raise Questions About Who Carries Insurance*, NPR (Apr. 3, 2017, 4:23 AM), https://www.npr.org/sections/alltechconsidered/2017/04/03/522222975/self-driving-cars-raise-questions-about-who-carries-insurance.
[115] *Id.*
[116] Jerry Albright, Alex Bell, Joe Schneider, & Chris Nyce, *Marketplace of Change: Automobile Insurance in the Era of Autonomous Vehicles*, KPMG, https://assets.kpmg.com/content/dam/kpmg/pdf/2016/06/id-market-place-of-change-automobile-insurance-in-the-era-of-autonomous-vehicles.pdf.
[117] *Id.*
[118] *Id.*
[119] *Id.*
[120] Noguchi, *supra* note 114.

them to track the speed of the vehicle as well as other behaviors, such as rapid braking.[121] In fact, many insurers offer rewards for safe driving (in the form of discounts) as an incentive for participation in the tracking device programs.[122]

Nevertheless, the present method of insurance rate calculation will prove to be problematic once self-driving cars dominate the market. Once the autonomous takeover occurs, it is no longer the risk that the human driver poses to be worried about, but rather the reliability and safety of the car's autonomous technology. One possible solution is for insurance companies to still mitigate the risk of roadway collisions but determine policy rates by making assessments about the safety and risks of each autonomous vehicle, "and then adjust consumer insurance rates accordingly."[123]

Of course, it logically follows that the safer the vehicle is, the cheaper insurance premiums should become, but this may not be the reality.[124] Insurance companies have been researching autonomous vehicles for quite some time and have found that while the rate of accidents may drop by up to eighty percent, the cost of future accidents caused by technological malfunctions may double due to the severity of those accidents and the expense of replacing the component parts of the new technology found within the vehicles.[125] Thus, insurance companies may not need to worry after all about being completely eliminated, but should still consider a drastic drop in revenues the further technology progresses to prevent these forthcoming technological malfunctions.

There is enough reason to believe that autonomous vehicles will grow the insurance industry before shrinking it. A report from Accenture and Stevens Institute of Technology speculates "that the switch to autonomous vehicles will generate at least $81 billion in new insurance revenues in the U.S. [alone] between 2020 and 2025."[126] The report attributes this rather surprising increase in revenues to the new need for cybersecurity, product liability for sensors, software, and algorithms, and insuring the security of public infrastructure.[127] There is a catch, the report warns, in order for

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[121] *Id.*
[122] *Id.*
[123] Jessica S. Brodsky, *Autonomous Vehicle Regulation: How and Uncertain Legal Landscape May Hit the Brakes on Self-Driving Cars*, 31 BERKELEY TECH. L.J. 851, 866 (2016).
[124] *Id.*
[125] *Id.*
[126] Michael Costtonis & Richard Kim, *Insuring Autonomous Vehicles: How Insurers Can Address an $81 Billion Near-Term Opportunity in Insuring Autonomous Vehicles*, ACCENTURE LLP, 1-2 (2017), https:ins.accenture.com/rs/897-EWH-515/images/Autonomous-Vehicles-POV.pdf.
[127] *Id.*

insurers to seize this new opportunity, they will need to change their business models to reflect proficiencies in telematics, big data and analytics, as well as new actuarial models.[128]

Though, the report does acknowledge that the window to capitalize on the alleged $81 billion in revenues is narrow, so insurers must reorganize their business models quickly.[129] Just because there is a possibility for steeply increased revenues initially does not mean that insurers will not begin to see premiums drop due to the assimilation of autonomous vehicles. Although the decline in the insurance industry seems inevitable, smart insurers that can recognize the changing technological environment have the opportunity to win the market share.[130]

As such, the report lists three new lines of business that smart insurers should consider exploring. First, the cybersecurity business would provide protection against "remote vehicle theft, unauthorized entry, ransomware and hijacking of vehicle controls," as well as protection against identity theft, breach of privacy, and the misappropriation of personal data.[131] Next, to break into the business of product liability for sensors, software, and algorithms, insurers will need to explore manufacture coverage for failures related to internet communications, software bugs, and sensory circuit failure.[132] Finally, to provide for public infrastructure, insurance may be provided for cloud server systems that "manage traffic and road networks, in addition to failure of external sensors and signals."[133]

The Insurance Institute for Highway Safety (IHS) in the United States agrees that safer technology does not automatically mean that all accidents will be avoided, and consumers can relax in the passenger seat.[134] IHS encourages automakers to warn consumers that they still need to be alert long after technology takes over.[135] In order to protect against the inevitable technology caused accidents, "they need to make sure the technology keeps the drivers engaged. [. . .] Just putting it in the owner's manual won't work," says IHS President, Adrain Lund.[136] This advice should also extend to

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[128] *Id.*
[129] *Id.*
[130] *How Autonomous Vehicles Will Grow Auto Insurance Before Shrinking It*, INSURANCE JOURNAL (May 19, 2017), https://www.insurancejournal.com/news/national/2017/05/19/451621.htm.
[131] *Id.*
[132] *Id.*
[133] *Id.*
[134] Jack Stewart, *Self-Driving Cars Are Confusing Drivers—And Spooking Insurers*, WIRED (Aug. 2, 2017, 7:00 AM), https://www.wired.com/story/self-driving-cars-insurance-ambiguity/.
[135] *Id.*
[136] *Id.*

insurers wishing to ditch their insurance policies the second they acquire a highly coveted autonomous vehicle.

F. The Entertainment Industry

According to a study by the Harvard Health Watch, an average American spends 101 minutes per day driving.[137] This means that over the course of one's lifetime, one spends approximately 37,935 hours driving a car (assuming that the person starts driving when they are 17 and continues driving until 78.7 years old).[138] It has been established that once autonomous vehicles are populous, productivity will increase, but realistically those 37,935 hours will not all be used for business purposes. This freed up time will also create opportunity for the entertainment industry to reach yet another aspect of our daily lives.

So, where will these new audiences turn once they have, "managed to sing themselves hoarse on old Britney Spears tunes[?]"[139] Some suggest that entrepreneurs in the Artificial Intelligence (AI) industry will be of the first to bite.[140] Amazon recently announced that Alexa's technologies will be incorporated into cars beginning in the UK.[141] "Voice is the future, and this is particularly true in cars. The ability to use your voice to control your smart home, manage to-do-lists, access Kindle content, and more makes for a safer, more enjoyable driving experience," said the director of Amazon, Aaron Brown, upon the announcement.[142]

The incorporation of Alexa into autonomous vehicles would suggest passengers of the future can "run errands" while riding in the car. The Alexa system may remind passengers when they are running low on household essentials and passengers can restock simply by a voice confirmation.[143] Conceivably, after enjoying (or loathing) their meal at a restaurant, passengers might give their review by voice on Yelp while driving home. Or, perhaps passengers will order UberEats while heading to their destination

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[137] *Moderate Exercise: No Pain, Big Gains*, HARVARD HEALTH PUBLISHING (May 1, 2017), https://www.health.harvard.edu/newsletter_article/Moderate_exercise_No_pain_big_gains.
[138] *See id.*
[139] Aiden Livingston, *The Hidden New Business Opportunity in Autonomous Cars*, VENTURE BEAT (Feb. 20, 2017), https://venturebeat.com/2017/02/20/how-well-stay-productive-in-the-connected-car/.
[140] *Id.*
[141] Samuel Gibbs, *Amazon's Alexa Escapes the Echo and Gets Into Cars*, THE GUARDIAN (Feb. 7 2017, 3:00 PM), https://www.theguardian.com/technology/2017/feb/07/amazon-alexa-car-logitech-zerotouch-voice-services-assistant.
[142] *Id.*
[143] *Id.*

and have their favorite restaurant meal meet them upon arrival. The incorporation of Amazon's Alexa into autonomous vehicles is especially brilliant considering the first owners of autonomous vehicles will likely be high-earning individuals.

Outside of the convenience that the AI industry will provide through technology like Amazon Alexa, Hollywood has its eye on sheer entertainment possibilities. "'Our mobile lifestyle is expanding into cars—that is the next journey for entertainment. Hollywood is an important part of that discussion,' [said] Ted Schilowitz, futurist at Paramount Pictures," before positing that the windshield could be the movie screen of the future.[144] Hollywood has great potential to flourish in the autonomous vehicle market because of potential revenue stemming from advanced advertising capabilities, such as interactive, geolocated advertising.[145] Picture driving down the road binge-watching your favorite television show when not only an advertisement comes on for a coffee shop that you're proximately close to, but you also receive the option of rerouting yourself to the coffee shop with the singular press of a button.

Adweek declared that the self-driving car will be the next great media channel due to cars being a "treasure trove for data."[146] This treasure trove of data will open opportunities for advertisers as a "precision marketing tool", creating supremely individualized marketing.[147] For instance, your car will know exactly what restaurants you frequent and where you get your hair done. This data offers prospect for competing businesses to cater their ads specifically to entice you to choose them over rival companies.[148]

Unfortunately, because of a seemingly exponential increase in entertainment options while in the car, there is one branch of the entertainment industry that will likely suffer after autonomous vehicles are fully introduced. Since the introduction of the radio in the Chevrolet Radio Sedan in 1922, the radio has largely survived despite frequent competitors such as Sirius satellite radio and Spotify.[149] Speculation of the death of the

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[144] Carolyn Giardina & Jon Alain Guzik, *Why Hollywood Could Make Billions From Self-Driving Cars*, HOLLYWOOD REPORTER (Aug. 28, 2017, 8:00 AM), http://www.hollywoodreporter.com/behind-screen/why-driving-cars-could-be-hollywoods-next-big-thing-1031554.

[145] *See id*.

[146] Thomas Bloch, *The Next Great Media Channel Is the Self-Driving Car. Will Brands Be Ready?*, ADWEEK (Oct. 30, 2017), http://www.adweek.com/agencies/the-next-great-media-channel-is-the-self-driving-car-will-brands-be-ready/.

[147] *Id.*

[148] *See id.*

[149] Jaja Liao, *Entertainment in the Age of Self-Driving Cars*, THE STARTUP (Apr. 12, 2017), https://medium.com/swlh/entertainment-in-the-age-of-self-driving-cars-be0439dc2dfa.

radio has a long history, but "in 2015, 91% of Americans over the age of 12 had listened to traditional AM/FM terrestrial radio in the past week."[150] Furthermore, in 2016, 90% of car commuters listened to the radio instead of CDs and internet radio streaming.[151] The reason for the radio's survival can likely be attributed to the lack of effort it takes to turn on as well as the fact that it does not demand much attention span usage.[152]

Nevertheless, once autonomous vehicles arrive, these two justifications for the radio's survival will be no more. With future technologies, it will be just as easy to answer email, watch television, or online shop as it currently is to turn on a car radio. Additionally, attention span will not be a factor as driving will require essentially no attention. There is always a chance that the traditional AM/FM radio will endure since it is a classic driving ritual, but I predict the radio industry's demise due to the interactive capabilities that other entertainment options provide.

G. Effects on Consumers

After contemplating the many ways autonomous vehicles will revolutionize industry, it is obvious that another group will be impacted at large—consumers. Try to picture what it felt like to live in a major urban city such as New York City in the early 1900s when the first automobile drove its way through a sea of horse drawn carriages.[153] Whether your reaction would be one of fear, excitement, awe, or entrepreneurial creativity, it would be practically impossible not to react.[154] After all, the introduction of the fully autonomous vehicle to the market will be much like the introduction of the automobile: many consumers will experience the commonality of some burden being made easier.

This is particularly true for both the elderly and the disabled. The generation of baby boomers will specifically benefit, as if it were not for autonomous vehicles, it is speculated that as the baby boom generation ages, "the number of elderly highway fatalities will surpass that of deaths from

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[150] *Id.* (citing *State of the News Media 2016*, PEW RESEARCH CENTER (June 15, 2016), http://assets.pewresearch.org/wp-content/uploads/sites/13/2016/06/30143308/state-of-the-news-media-report-2016-final.pdf.).
[151] *Id.*
[152] *Id.*
[153] Nabeel Hyatt, *Autonomous Driving is Here, and It's Going to Change Everything*, RECODE (Apr. 19, 2017, 7:30 PM), https://www.recode.net/2017/4/19/15364608/autonomous-self-driving-cars-impact-disruption-society-mobility.
[154] *Id.*

drunk driving."[155] Indeed, autonomous vehicles present a great opportunity to "bridge the gap between the abilities of older and younger drivers."[156] Thus, the safety of all drivers is improved.[157] Perhaps as a result, discrimination of the elderly will decrease and less laws will need to be passed that unfairly target older drivers.[158]

Increased mobility for the elderly also means driving at night, in bad weather, or long distance is no longer a problem. The ability to be transported during abnormal conditions will provide a great freedom for the elderly considering that a 2008 survey by the Center for Disease Control and Prevention (CDC) found that 15% of those sixty-five or older had stopped driving all together, while many reported they had to be selective with the times they chose to drive.[159] The freedom that equal access to transportation provides is sure to improve the elderly's quality of life.

According to the CDC, "more than 60 million people are hearing or vision impaired."[160] Furthermore, "an estimated 3.5 million Americans have some form of autism, and about 400,000 have Down syndrome."[161] These consumers with disabilities "are constantly managing the logistical challenges associated with getting groceries, taking the kids to school[,]" or going to work.[162] In fact, the employment rate for the disabled "continues to decline even after modest recovery from the great recession."[163] Autonomous vehicle technology has the power to stop this decline and allow more disabled people to attend work as significant transportation barriers are removed.[164]

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[155] Alan Leo, *In Tomorrow's Car, Who's Driving*, MIT TECHNOLOGY REVIEW (May 23, 2001), https://www.technologyreview.com/s/401027/in-tomorrows-car-whos-driving/.
[156] David V. Lampman, *Fun, Fun, Fun, 'Til Sonny (or the Government) Takes the T-Bird Away: Elder Americans and the Privilege to be Independent*, 12 ALB. L.J. SCI. & TECH. 863, 878 (2002).
[157] *Id.*
[158] *Id.*
[159] Ashley Halsey III, *Driverless Cars Promise Far Greater Mobility for the Elderly and People with Disabilities*, WASHINGTON POST (Nov. 23, 2017), https://www.washingtonpost.com/local/trafficandcommuting/driverless-cars-promise-far-greater-mobility-for-the-elderly-and-people-with-disabilities/2017/11/23/6994469c-c4a3-11e7-84bc-5e285c7f4512_story.html?utm_term=.7c420ce987c5.
[160] *Id.*
[161] *Id.*
[162] Jules Polonetsky, *Self-Driving Cars: Transforming Mobility for The Elderly and People with Disabilities*, THE HUFFINGTON POST (Oct. 24, 2016), https://www.huffingtonpost.com/jules-polonetsky/selfdriving-cars-transfor_b_12545726.html.
[163] *Id.*
[164] *Id*.

Most importantly, the new technology has the power to bring some sense of independence and normalcy to those who crave it most.

In late 2017, Waymo, the company that started as Google's autonomous-car division, announced it has integrated "several design elements intended to help the elderly and people with disabilities."[165] The company has commenced the design of a smartphone app that will be "easy to use and accessible to those with disabilities."[166] Waymo is further considering "ways in which a vehicle could give an audible signal to a blind person when it arrives for pickup."[167] Moreover, "key control buttons current Waymo Level 4 vehicles are marked in Braille."[168]

Hearing-impaired passengers also are presented with the option of following the route on screens that "show selected information including the car's route, traffic signals, crosswalks, other cars, pedestrians[,] and cyclists."[169] As an extra precaution the Waymo cars are equipped "with a 'Pull Over' button placed next to the 'Start' button and a "Help" button that will initiate two-way voice communications with a control center operator."[170]

Although Waymo is making advances to providing equal access to transportation for people with disabilities, in the grand scheme of things, there is little attention being given to the role autonomous vehicles can play in serving individuals with disabilities. As such, the disabled community should seize the opportunity to come together, organize, learn more about the technology, and enhance its advocacy efforts. Likewise, technology developers will benefit by taking a cue from Waymo, and better educating themselves on the need and value of designing their vehicles with the disabled community in mind.[171]

Because tech companies have spent so much time, almost a decade of research, focusing on solely autonomous technology it is almost easy for the companies to overlook how consumers will respond.[172] Waymo is

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[165] Halsey, *supra* note 159.
[166] *Id.*
[167] *Id.*
[168] *Id.*
[169] *Id.*
[170] Halsey, *supra* note 159.
[171] Henry Claypool, Amitai Bin-Nun, Ph.D. & Jeffrey Gerlach, *Self-Driving Cars: The Impact on People with Disabilities*, SECURE ENERGY (Jan. 2017), http://secureenergy.org/wp-content/uploads/2017/01/Self-Driving-Cars-The-Impact-on-People-with-Disabilities_FINAL.pdf.
[172] *See* Mark Bergen, *Google Will Begin Testing Autonomous Cars with Consumers*, AUTO NEWS (Apr. 25, 2017, 6:45 AM), http://www.autonews.com/article/20170425/COPY01/304259948/google-will-begin-testing-autonomous-cars-with-consumers.

cognizant of the potential for fear of autonomous vehicle technology by consumers.[173] In April of 2017, Waymo decided to address these concerns head on by starting to test its vehicles with consumers in the United States.[174] Waymo decided to test out its technology in Phoenix, Arizona via a fleet of 500 customized Chrysler Pacifica minivans.[175]

If you were one of the lucky residents of Phoenix, as part of the early rider program you could use an app to book a free autonomous minivan to take you to the destination of your choice.[176] Of course, Waymo has been testing its vehicles for some time, but only with its employees and contractors as testers.[177] In contrast, with new consumers as testers, the company can generate data on how people react and use self-driving cars, with more concrete tips on ways to generate revenue from the technology.[178]

Similarly, citizens of Pittsburgh, Pennsylvania have been sharing their roadways with self-driving Ubers for almost a year.[179] Despite one of Uber's Arizona test cars getting struck by a human driver car making an illegal left turn, Uber's testing with human passengers seems to be going well.[180] The fact that Uber's Pittsburgh test cars come with two Uber employees in the front seat might have something to do with its success.[181] These test drives are a great way for Uber to work out the kinks while navigating an urban terrain. And there are many kinks: on average, these autonomous Ubers required their front seat employees to intervene in the driving every 0.8 miles.[182]

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[173] *Id.*
[174] *Id.*
[175] *Id.*
[176] *Id.*
[177] Bergen, *supra* note 172.
[178] *Id.*
[179] *See* Robert Siegel & Art Silverman, *Pittsburgh Offers Driving Lessons for Uber's Autonomous Cars*, NPR (Apr. 3, 2017, 4:02 PM), https://www.npr.org/sections/alltechconsidered/2017/04/03/522099560/pittsburgh-offers-driving-lessons-for-ubers-autonomous-cars.
[180] Ryan Randazzo, *Uber's Self-Driving Cars Back on the Road after Friday Crash in Tempe*, AZ CENTRAL (Mar. 27, 2017, 4:31 PM), https://www.azcentral.com/story/money/business/tech/2017/03/27/ubers-self-driving-cars-back-road-after-friday-crash-tempe/99696116/.
[181] *See* Siegel, *supra* note 179.
[182] *Id.* (*citing* Johana Bhuiyan, *Uber's Autonomous Cars Drove 20,354 miles and Had to be Taken Over at Every Mile, According to Documents*, RECODE (Mar. 16, 2017), https://www.recode.net/2017/3/16/14938116/uber-travis-kalanick-self-driving-internal-metrics-slow-progress.)

IV. CONCLUSION

As the days, months, and years quickly pass, as a society, we find ourselves closer than ever to a reality where autonomous vehicles are the norm. It is imperative that legislatures work with members of the technology industry, travel industry, commercial real estate industry, and other communities to be impacted to develop plans for integration and workable solutions to the multitude of problems the vehicles present. At this point, the advent of autonomous vehicles is inevitable, thus lawmakers need to be prepared to accommodate for the largest innovation in the auto industry since the origination of the automobile. If the proper legislative and regulative tools are used, this technology has much greater potential to be an abundant public benefit and dramatically decrease roadway deaths, drunk driving, while improving roadway mobility for all.

Not just legislatures, but also society at large should educate themselves on the changes, both positive and negative, that autonomous vehicles will bring. If fully educated, groups that will benefit from the cars, such as the disabled, can lobby to accentuate those positive benefits. Also with education and understanding comes decreased fear that many consumers are expected to experience. Finally, societal awareness of the technological issues the vehicles will present prevents problems that have already proven fatal such as overreliance on the automated technology.